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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/634,964	08/05/2003	Zhendong Liu	02039US	6941

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Rodel Holdings, Inc.
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EXAMINER

GEORGE, PATRICIA ANN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 11/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/634,964

Applicant(s)

LIU, ZHENDONG

Examiner

Patricia A. George

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1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 October 2005 and 21 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) 8-9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date Oct. 3, 2005
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Amendment

Amendments received October 3rd, 2005 and October 21st, 2005 were received and are acknowledged.

Election/Restrictions

Applicant's election of group I in the reply filed on 10/03/2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 - 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al (US Patent No. 6,709,316) in view of Yano (US Patent No. 6,375,545).

The reference of Sun et al discloses an aqueous chemical mechanical planarizing composition (col. 9, l. 14). The composition comprises an oxidizer in the form of promoting barrier removal since the composition is the same (col. 6, lines 57-

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59); an abrasive in the form of (col. 7, lines 9-12); an inhibitor in the form of (for decreasing removal of a metal interconnect) (col. 6, lines 59-65). In addition, Sun et al. clearly discloses ph adjusting agent/s can adjust the CMP composition to a range of about 2.5 to about 11, which encompassed the claimed less than 4. Sun et al. also clearly explain the adjusting agents can be comprised of bases, inorganics acids, and/or organic acids (col.6, l.66 to col.7, l.3). Sun teaches a tantalum nitride removal rate of at least eighty percent of copper removal rate (col.3, lines32-34). Sun cites a 1:0:0 removal rate which indicates that 100% of the barrier layer (i.e. TaN) is removed relative to 0% of the copper and 0% of the dielectric.

In addition Sun teaches a pad pressure of 13.8 kPa. (col. 12, line 1) which is within Sun's range of 1 to 8 psi (6.895 kPa to 55.158 kPa). Sun broadly discloses the use of a chelating agent (col.6, lines 49-54), including the use of carboxyl acids (see claim 10).

Sun fails to disclose the use of water soluble polymers, made from carboxyl acids, as a feature of the chelating agent.

Yano teaches that such chelating agents are useful (US Patent No. 6,375,545 col. 9, lines 8-16) in CMP slurry (Col. 16, L. 8). (Also see column 6, line 23 –29.)

It would have been obvious to one ordinary skill in the art at the time of invention was made, to include a chelating agent with polymers in the CMP slurry of Sun because Yano teaches polymer blends in slurry are useful in they can be prepared to have ranges of conductivity to enhance the chelating effect of forming bonds with metals. As

a result, particulates of the interconnect metals are carried away from the surface of the wafer maximizing removal rates while decreasing surface scratching.

As to claims 2 and 3, Sun broadly discloses the use of a chelating agent (col.6, lines 49-54), including the use of carboxyl acids (see claim 10).

Sun fails to disclose the use of polymers, made from carboxyl acids, as a feature of the chelating agent.

Yano teaches wherein the carboxylic acid polymer comprises a homopolymer or a copolymer (col. 3, lines 8-29) and wherein the carboxylic acid polymer comprises polymaleic acid (col. 7, lines 61-61, and col. 8, line 1). See complete discussion of Sun in view of Yano above.

It would have been obvious to one ordinary skill in the art at the time of invention was made, to modify Sun's CMP slurry by adding said chelating agents as Yano teaches they are useful (col. 3, lines 8-29) in CMP slurry.

As to claim 4, see Sun's teaching on pH above.

As to claim 5, Sun teaches an aqueous chemical mechanical planarizing composition comprising 0.05 to 15 wt % abrasive (col. 7, lines 9-12); 0.1 to 10 wt % oxidizing agent (col. 6, lines 57-59); and 0.02 to 1 wt% benzotriazole (col. 6, lines 59-65) which falls within the range of the instant invention. In addition, Sun et al. clearly discloses ph adjusting agent/s can adjust the CMP composition to a range of about 2.5 to about 11, which encompassed the claimed less than 4. Sun et al. also clearly explain

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the adjusting agents can be comprised of bases, inorganics acids, and/or organic acids (col.6, l.66 to col.7, l.3). Furthermore, Sun et al. teaches use of phosphoric and nitric acids as a pH adjusting agents (col.7, l. 3-4 and l.59). Sun et al. teaches a tantalum nitride removal rate of at least eighty percent of copper removal rate (col.3, lines32-34). Sun cites a 1:0:0 removal rate which indicates that 100% of the barrier layer (i.e. TaN) is removed relative to 0% of the copper and 0% of the dielectric at a pad pressure of 13.8 kPa. (col. 12, line 1) with in Sun's range of 1 to 8 psi (6.895 kPa to 55.158 kPa). Sun's range is within the claimed range.

The reference of Sun fails to teach the wt % of a carboxylic acid polymer.

Yano teaches 0.01 to 5 wt % of a carboxylic acid polymer (col. 9, lines 20-22), wherein at least one repeat unit of the polymer has at least two carboxylic acid functionalities (col. 3, lines 8-29).

It would have been obvious to one ordinary skill in the art at the time of invention was made, to modify to modify the CMP slurry of Sun to include a chelating agent with polymers because polymer blends in slurry are useful in they can be prepared to have ranges of conductivity to enhance the chelating effect of forming bonds with metals. As a result, particulates of the interconnect metals are carried away from the surface of the wafer maximizing removal rates while decreasing surface scratching.

As to claims 6 and 7, see the references of claims 2 and 3.

Response to Remarks

Applicants' submission that the combined references fail to disclose or suggest claims 1 to 7, is not persuasive.

Applicants remark that the reference of Sun et al. does not disclose a second step barrier removal slurry. The claimed invention is a composition therefore process steps are not commensurate with the scope of the invention. Applicants state Sun et al. fails to disclose a pH less than 4 adjusted with an inorganic acid. Sun et al. clearly discloses pH adjusting agent/s can adjust the CMP composition to a range of about 2.5 to about 11, which encompassed the claimed less than 4. Sun et al. also clearly explain the adjusting agents can be comprised of bases, inorganics acids, and/or organic acids (col.6, l.66 to col.7, l.3). Applicants say Yano et al. do not disclose the claimed water soluble polymer, yet Yano et al. clearly teaches carboxylic acid polymer particles have a hydrophilic group (col.3, l.23-29). Yano teaches 0.01 to 5 wt % of a carboxylic acid polymer (col. 9, lines 20-22), wherein at least one repeat unit of the polymer has at least two carboxylic acid functionalities (col. 3, lines 8-29).

With respect to claims 2-7, please refer to discussion above.

That the reference of Sun et al. does not disclose a selective second step is noted but not persuasive because the tantalum removal rate of the solution is a property ascribed to the solution and not an active process step.

Conclusion

The remarks and amendments filed on October 3rd, 2005 and October 21st, 2005 under 37 CFR 1.131 have been considered but are ineffective to overcome the combined reference of Sun et al. of U. S. Patent No. 6,709,316, in view of Yano et al. of U.S. Patent No. 6,375,545.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia A. George whose telephone number is (571) 272-5955. The examiner can normally be reached on weekdays from 7:00am to 4:30pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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11/05

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER

